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The objective of this research was to use recovered acoustic data recorded on analog tapes in the late 1970s to early 1980s to assist in characterizing the ambient noise properties of the Philippine Sea.
The principle findings were the following. In a previous study of acoustic data recorded above and below the critical depth in the NE Pacific [1] it was found that below the critical depth the average omni level noise at 50 Hz associated with distant shipping was about 55 dB, whereas above the critical depth the noise associated with distant shipping was on the order of 75 dB, a 20 dB difference. For the Philippine Sea location it was found that below the critical depth the average omni level noise at 50 Hz associated with distant shipping was about 67 dB, whereas above the critical depth the noise associated with distant shipping was on the order of 75 dB, an 8 dB difference. Further, it was observed that the omni noise levels due to shipping (50-200 Hz during a time with low wind speeds) at the V4 site agreed with the new 2007 measurements.

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Memorandum

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FROM: David P. Knobles

TO: Ellen S. Livingston, ONR 321

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Ambient noise analysis of acoustic data from the Philippine Sea

The objective of this research was to use recovered acoustic data recorded on analog tapes in the late 1970s to early 1980s to assist in characterizing the ambient noise properties of the Philippine Sea. The recovered data were analyzed for the information they contained on the frequency and wind dependence of the ambient noise below the critical depth. The critical depth is the depth in the water column where the speed of sound is equal to the speed of sound at the surface. Ambient noise values have been obtained for two locations (V3 and V4) in the Philippine Sea and compared to previous results obtained in the NE Pacific.[1] For the V4 site, the ambient noise levels were compared to recent measurements made by the Applied Research Laboratories, The University of Texas at Austin (ARL:UT) in 2007 at approximately the same location.

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It was of interest to note that above the critical depth, both the NE Pacific and the Philippine Sea had similar ambient noise levels to distant shipping. In the previous NE Pacific analysis [1] it was demonstrated that if one approximately knew the transmission loss characterstics (by knowing the seabed geoacoustic structure) and the approximate location of the maior shipping lanes, then one could

predict the 20 dB difference in levels above and below the critical depth. A similar study was made for the Phillipine Sea location. Using the known location of the shipping lanes and an approximate geoacoustic description of the seabed (50 meters of soft clay over basalt) the intrinsic attenuation of the clay was changed untill the observed 8 dB difference in levels above and below the critical depth was reporduced. This same geoacoustic profile has now been successful in reproducing measured transmission loss on a VLA for ranges beyond the Reliable Acoustic Path (RAP) range. The idea that the geoacoustic structure of the seabed plays an important role in the character of the ambient noise was demonstrated in a recent study by Knobles et al. [2] that compared wind domoninated measurements in deep water environments with depth excess to recent measurements off the New Jersey coast. Using a normal mode approach it was shown that for the deep water case the wind driven noise is dominated by the modal continuum whereas for shallow water the discrete modal spectrum can play an important role depending on the geo-acoustic structure of the seabed. For example, in hard sediments wind driven noise levels in shallow water can exceed those in deep water by as much as 10-15 dB.

REFERENCES

1. R. Gaul, D. P. Knobles, J. Shooter, and A. Wittenborn, "Ambient Noise Analysis of Deep Ocean Measurements in the Northeast Pacific," IEEE J. Ocean. Eng. **32** (2007).
2. D. P. Knobles, "On the nature of wind-driven ambient noise in a shallow water environment with a sandy seabed," submitted to J. Acoust. Soc. Am. Letters March 2008.